WHAT IS CLAIMED IS:

1. A method for fabricating a multi-layer electroplating mask for the formation of a submicrometer structure, the multi-layer electroplating mask including a substrate, a seedlayer deposited on said substrate, a first photoresist layer deposited on said seedlayer, a hard mask layer deposited on said first photoresist layer, and a second photoresist layer deposited on said hard mask layer, said first photoresist layer being thicker than said second photoresist layer, comprising:

performing a photoresist etch of said first photoresist layer to define a trench having vertical sidewalls; and

after said photoresist etch, performing a silylation of said trench for a predetermined period of time to narrow said trench in width.

- The method according to claim 1, wherein said photoresist etch comprises a reactive ion etching process.
- The method according to claim 1, wherein said photoresist etch comprises an inductively coupled plasma etching process.
- 4. The method according to claim 1, further comprising:

prior to said photoresist etch, lithographically patterning said second photoresist layer with an exposure;

developing the second photoresist layer; and etching said hard mask layer.

- 5. An electroplating mask formed by the process of claim 1.
- 6. The electroplating/mask according to claim 5 having a trench width of less than 0.3 micrometers.

A method for fabricating a multi-layer electroplating mask for the formation of a submicrometer magnetic structure, the multi-layer electroplating mask including a substrate, a seedlayer deposited on said substrate, and a photoresist layer deposited on said seedlayer, said photoresist layer having a thickness of about 4 micrometers to about 6 micrometers, comprising:

lithographically patterning said photoresist layer with an exposure to define a trench having vertical sidewalls; and

performing a silylation of said trench for a predetermined period of time to narrow said trench in width.

The method according to claim, further comprising:
prior to said silylation, developing said photoresist layer.

- 9. An electroplating mask formed by the process of claim 7.
- 10. The electroplating mask according to claim 9 having a trench width of less than 0.3 micrometers.

A method of fabricating a submicrometer structure from a multilayer electroplating mask structure that includes a substrate, a seedlayer deposited on said substrate, and a first photoresist layer deposited on said seed-layer, comprising:

lithographically patterning said photoresist layer with an exposure to define a trench having vertical sidewalls;

developing said photoresist layer;

performing a silylation of said trench to narrow said trench in width;

performing an electroplating process to form a submicrometer structure that is coupled to said seedlayer.

The method according to claim X, wherein said formed structure has a width of less than 0.3 micrometers.

The method according to claim 1, further comprising:
removing excess photoresist from said mask after said electroplating.

The method according to claim \mathcal{M} , wherein said seedlayer comprises a metallo-magnetic material, and wherein said structure formed is a magnetic pole.

A method of fabricating a submicrometer structure from a multi-layer electroplating mask structure that includes a substrate, a seedlayer deposited on said substrate, a first photoresist layer deposited on said seedlayer, a hard mask layer deposited on said first photoresist layer, and a second photoresist layer deposited on

said hard mask layer, said first photoresist layer being thicker than said second photoresist layer, comprising:

performing a photoresist etch of said first photoresist layer to define a trench having vertical sidewalls:

after said photoresist etch, performing a silylation of said trench for a predetermined period of time to narrow said trench in width; and

performing an electroplating process to form a submicrometer structure that is coupled to said seedlayer.

The method according to claim 18, wherein said formed structure has a width of less than 0.3 micrometers.

The method according to claim 15, further comprising:

prior to said photoresist etch, lithographically patterning said second photoresist layer with an exposure:

developing the second photoresist layer; and etching said hard mask layer.

The method according to claim 16, further comprising:
removing excess photoresist from said mask after said electroplating.

The method according to claim 18, wherein said multi-layer electroplating mask structure further includes a protective layer disposed in between said seed-layer and said first photoresist layer.

29. The method according to claim 19, wherein said seedlayer comprises a metallo-magnetic material, and wherein said structure formed is a magnetic pole.

- 21. A device used to fabricate an electroplating mask, comprising:
- a hard mask etch chamber for performing a hard mask etch process on the electroplating mask;
- a resist etch chamber for performing a resist etch process on the electroplating mask to define a trench having vertical sidewalls; and
- a silylation chamber for performing a silylation process on the electroplating mask to narrow said trench in width.
- 22. The device according to claim 2/1, further comprising:
- a transfer module housing a robotic system to transfer the electroplating mask between said hard mask etch, said resist etch, and said silylation chambers.
- 23. The device according to claim 22, further comprising:
- a load lock module from which electroplating masks can be loaded into or unloaded from said transfer module.
- 24. The device according to claim 21, further comprising: a control unit to control a time of said silylation process.